

To keep every cog and wheel is the first precaution of intelligent tinkering. —Aldo Leopold

Virginia is blessed with a great diversity of habitats, as well as the plants and animals, that inhabit them. Sandy beaches, wind-tide marshes, cypress-tupelo swamps, Piedmont prairies, boulder-strewn rivers, and spruce and fir-capped mountains are just a few of the places that support the great variety of plants and animals – some 32,000 species – that comprise our “common wealth”. The Department of Conservation and Recreation’s (DCR) Natural Heritage Program is charged with protecting this biodiversity by focusing on the most rare and imperiled species and natural communities, and it plays a central role in the Commonwealth’s overall land conservation efforts. Working closely with other state, federal and local agencies, nonprofit conservation organizations and private citizens, the Natural Heritage Program gathers and distributes information on the state’s biodiversity and seeks protection of sites that support rare species and significant natural communities. DCR manages the state’s growing natural area preserve system, which supports many populations of rare species and examples of the state’s diverse natural communities. The lands set aside as natural area preserves are vital, not only to our sense of place, but also improve our scientific understanding, enhance public education and increase outdoor recreation opportunities.



Hughlett Point Natural Area Preserve. Photo by Irvine Wilson.

Findings

- Virginia ranks fourth among Eastern states for the number of federally endangered and threatened species.
- Fewer than 8 percent of Virginia’s 1,500 rare plant and animal species are legally protected under federal or state law.
- The 2006 *Virginia Outdoors Survey* (VOS) found that the fifth most popular activity was visiting natural areas, up from 11th in 2001.
- Southwest Virginia is the country’s leading hotspot of aquatic diversity, but many of the freshwater mussels and fish found there are at risk of extinction. Classification and understanding of Virginia’s freshwater biological diversity, which is fundamental to its conservation, remains a significant challenge.
- DCR conducts the only comprehensive statewide inventory that documents the location and ecological status of natural communities and rare plant and animal species.
- DCR is developing better mechanisms for the planning, targeting and protection of key resource lands through the development of an expanded *Virginia Outdoors Plan* and its work on the Virginia Conservation Lands Needs Assessment.
- Private lands will play a critical role in the protection of Virginia’s natural heritage resources. At least 60 percent of identified sites supporting natural heritage resources occur on private lands.
- Virginia has 627 identified globally significant conservation sites that total more than 740,000 acres. These are not adequately protected to ensure the long-term viability of the natural heritage resources they support.
- Virginia is rich in karst resources with more than 4,300 known caves. Karst aquifers supply drinking water to rural citizens throughout the western part of the state. Karst springs support the base flow of most of the major rivers west of the Blue Ridge, and are critical to the protection of water quality and



Exotic species like Japanese stiltgrass (*Microstegium vimineum*) are a major threat to biological diversity. Photo by Gary Fleming.

quantity. More than 110 cave organisms are globally rare and many live in only one or two caves.

- DCR's Natural Area Preserve system is a statewide network of 50 dedicated natural areas totaling 42,296 acres, as of September 1, 2007 (see Map IX-8).
- Invasive exotic species have become the second greatest threat, after habitat loss, to biological diversity. More than 300 exotic species have been reported in Virginia.

Recommendations

- DCR, other natural resource agencies and academic institutions should expand biological inventory efforts across the state to better understand the distribution, status and population trends of natural heritage resources.
- DCR should expand efforts to create and provide natural area conservation information and make it available to a diverse group of clients and users, including completion and full utilization of the Virginia Conservation Lands Needs Assessment by the fall of 2007.
- DCR should support and expand Virginia Commonwealth University's Interactive Stream Assessment Resource (INSTAR) to better understand and conserve the Commonwealth's freshwater biological diversity.

- The Commonwealth should work toward implementation of the Department of Game and Inland Fisheries' Virginia Wildlife Action Plan.
- The Commonwealth should increase assistance to localities in their planning efforts for the protection of natural areas as a part of their recreational offerings.
- The Commonwealth should secure a broad-based stable funding source for land conservation, including lands that support natural heritage resources, and ensure representation on protected lands for all of the state's natural community types and rare species.
- State and local land conservation organizations should work to conserve natural heritage resources through conservation easements.
- DCR should expand the Natural Area Preserves system by adding lands to the existing preserves to enhance protection of their designated conservation sites. The system should also be expanded through a combination of acquisitions and easements for an additional 30 high-priority conservation sites as natural area preserves across Virginia by 2012.
- DCR should increase awareness of the environmental significance of Virginia's karst regions (limestone areas with underground streams, sinkholes and caves) through the Natural Heritage Karst Program.



Exploring karst areas. Photo by Irvine Wilson.

- DCR should increase its capacity to assist public and private land managers and owners with the management and restoration of natural heritage resources on their properties.

- DCR should secure the resources necessary to meet the stewardship needs of an expanded system of lands supporting natural heritage resources, for example: improved resource management, increase public access opportunities and improve site security.
- Local and state natural resource agencies should enhance efforts to determine the distribution and status of invasive exotic species and to devise effective measures for their control, particularly where they threaten rare species or unique natural communities.

History and overview

The Virginia Natural Heritage Program was started in 1986 to protect the state's natural diversity. It originated as a cooperative effort of DCR and The Nature Conservancy, a private nonprofit organization, and in 1988 it became a division exclusively within DCR. The Virginia program is a member of NatureServe, the international network of natural heritage programs that includes all 50 states, all Canadian provinces and 18 Latin American countries. This partnership greatly enhances the quality and utility of Virginia's conservation information through training, consultation and information exchange. In 2006, Virginia's program was recognized by NatureServe as the most outstanding natural heritage program in the Western Hemisphere.

The Natural Heritage Program focuses on the identification, protection and stewardship of natural heritage resources defined in the *Code of Virginia* as the habitat of rare, threatened or endangered plant and animal species, rare or state significant natural communities or geologic sites, and similar features of scientific interest benefiting the welfare of the citizens of the Commonwealth. The habitat of the Shenandoah salamander, limestone caves, freshwater tidal marshes and shorebird nesting sites are but a few examples of these natural heritage resources.

Central to this mission is the identification and protection of natural areas, both lands and waters, supporting habitats for rare species and significant natural communities. Natural areas are significant for the living resources they support, but they are also important for their outdoor recreation values and are a critical component of a comprehensive outdoor recreation system. The 2006 VOS found that the fifth most popular outdoor activity of the public is visiting natural areas. Many of the nation's state natural heritage programs were launched with Federal Land and Water Conservation Funds, based on the recognition that natural areas provide a critical component to any outdoor recreation portfolio.



One of many stewardship responsibilities involves counting shorebird nests on Wreck Island Natural Area Preserve. Photo by Sandra Erdle.

Many tasks must be accomplished in order to protect and manage Virginia's diverse array of native plant and animal species and natural communities. DCR's Natural Heritage Program divides those tasks among five interdependent units – inventory, information management, project review, natural area and karst protection, and natural area stewardship.

Inventory

The Natural Heritage Program inventory staff members conduct the only comprehensive statewide inventory that documents the location and ecological status of natural communities and rare plant and animal species. This ongoing inventory is conducted by staff ecologists, botanists and zoologists, contract staff, volunteers and cooperators. These staff members assist private and public land managers and local governments with regional and county natural area surveys. Recent inventories have included all National Park Service lands, the Appalachian Trail, major Department of Defense facilities, national forest lands and selected state parks.

Inventory biologists also help assign global and state rarity ranks to all of Virginia's native species. These ranks reflect a species' risk of extinction throughout its

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entire range (global rank) and within Virginia (state rank). With this ranking system, Natural Heritage Program staff are able to prioritize inventory and protection needs by identifying those natural heritage resources most likely to be lost without conservation action. Inventory ecologists continue to refine the state's natural community classification system with descriptions for Virginia's 120 natural community types, including state and globally rare limestone barrens, shale barrens, sea-level fens and tidal freshwater marshes. This community classification can be viewed on DCR's website at: www.dcr.virginia.gov/natural_heritage/nctoc.shtml.

Another initiative is to assist with the development and publication of the first comprehensive manual of Virginia's flora in modern history. Inventory staff are working in cooperation with the nonprofit Flora of Virginia Project to have the book and an accompanying website ready by 2011. It will help meet the urgent needs of scientists, students and other citizens interested in plants and their habitats by providing a deeper understanding and appreciation of Virginia's flora and ecosystems.

The rapid pace of changes in Virginia's landscape necessitates more comprehensive inventory of natural heritage resources. The Commonwealth must increase biological inventory efforts by DCR, as well as other agencies and institutions. The Department of Game and Inland Fisheries' Virginia Wildlife Action Plan requires ongoing support for data collection and implementation of the plan. Another critical need is to develop a freshwater aquatic community classification system to permit consistent assessment of the biological diversity of our streams and rivers through expanded support for Virginia Commonwealth University's Interactive Stream Assessment Resource (INSTAR).

Virginia has more than 1,500 plant and animal species that are rare within the state. Five plants, five vertebrates and many invertebrates are found only in Virginia. At least 26 species of vertebrates, as well as freshwater mussels, have been extirpated from Virginia. Due to habitat alteration from dam construction, water withdrawal, sedimentation, pollution and introduction of non-native species, 75 percent of Virginia's freshwater mussels are at risk. Southwest Virginia is the country's leading hotspot of aquatic diversity, but more understanding of Virginia's aquatic species and communities is needed.

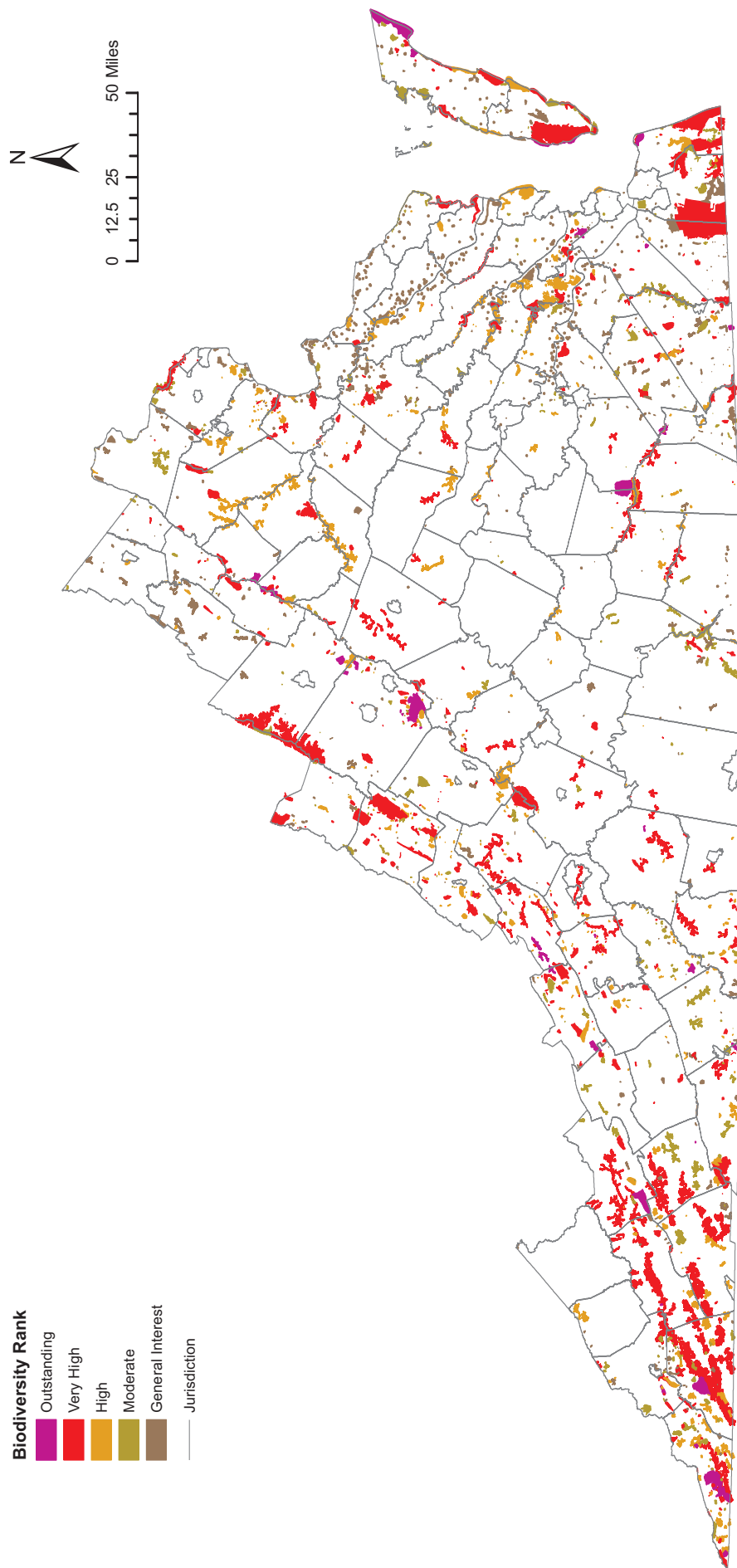
Information management

Protecting and managing natural heritage resources requires that large amounts of data be carefully catalogued and stored. Such data must also be made accessible to a variety of users. DCR's natural heritage information staff members use an assortment of GIS and database platforms to manage collected data. Data maintained by DCR are used internally, as well as by other land and resource managers and citizens in order to set protection and management priorities and provide a scientific basis for land management planning. A central component of data collected by DCR is conservation sites. These sites are the most critical areas to protect in order to secure habitat for terrestrial natural heritage resources. Similarly, important aquatic habitats, referred to as stream conservation units (or SCUs), have been delineated, as have significant karst areas. Nearly 2,200 conservation sites, SCUs and significant karst areas have been delineated (see Map IX-6).

DCR makes data available, by way of a subscription service, to land trusts, local governments and environmental consulting firms. The level of detail available to subscribers is restricted to protect sensitive information.

Another GIS-based initiative is the Conservation Lands Database. Conservation lands are public (and some private) lands in Virginia that have value for natural resource conservation, outdoor recreation and open-space protection (see Map IX-7). Included are federal and state lands, for example national parks, national wildlife refuges, forest service lands, some Department of Defense lands, state wildlife management areas, state forests, and state parks and natural areas. Also included are local parks, lands owned as preserves by nonprofit conservation organizations such as The Nature Conservancy, and lands held under conservation easement by the Virginia Outdoors Foundation or other land trusts. This information serves as the Commonwealth's official database on protected lands and is available online at www.dcr.virginia.gov/natural_heritage/conslandmap.shtml.

Closely tied to the Conservation Lands Database is DCR's Conservation Lands Needs Assessment (VCLNA), an ongoing effort to identify the most important areas for future land conservation and undeveloped corridors to connect them. While DCR anticipates completing and fully implementing this project by the fall of 2007, the VCLNA will require ongoing refinement and updating in future years. DCR has a strong commitment to share the VCLNA with all of Virginia's land conservation agencies and organizations, so that the benefits of this powerful tool can be realized.





Land protection of special areas like old growth cypress-tupelo swamps should be a priority. Photo by Irvine Wilson.

DCR's natural heritage project review plays a key role in evaluating proposed development projects so that they do not adversely affect natural heritage resources. DCR staff provide guidance to developers to help avoid impacts on rare species habitats. Project review staff members also respond to requests from the public for information about rare species and natural communities and provide outreach to localities in their planning efforts. As Virginia's population grows, the importance of DCR's efforts to protect natural heritage resources will be essential.

Natural area protection

Key to natural area protection is careful conservation planning that ultimately leads to land protection. Natural area protection can involve non-binding agreements, conservation easements or fee simple acquisition of land to secure habitat for the rarest and most threatened examples of our natural heritage. Protection methods are chosen based on the specific conservation goals for each natural area. Examples of tools for protecting biodiversity include dedication of natural areas into a legally established system of state natural area preserves, acquisition of land, acquisition of conservation easements, establishment of management agreements and voluntary protection by the landowner through the Virginia Registry of Natural Areas.

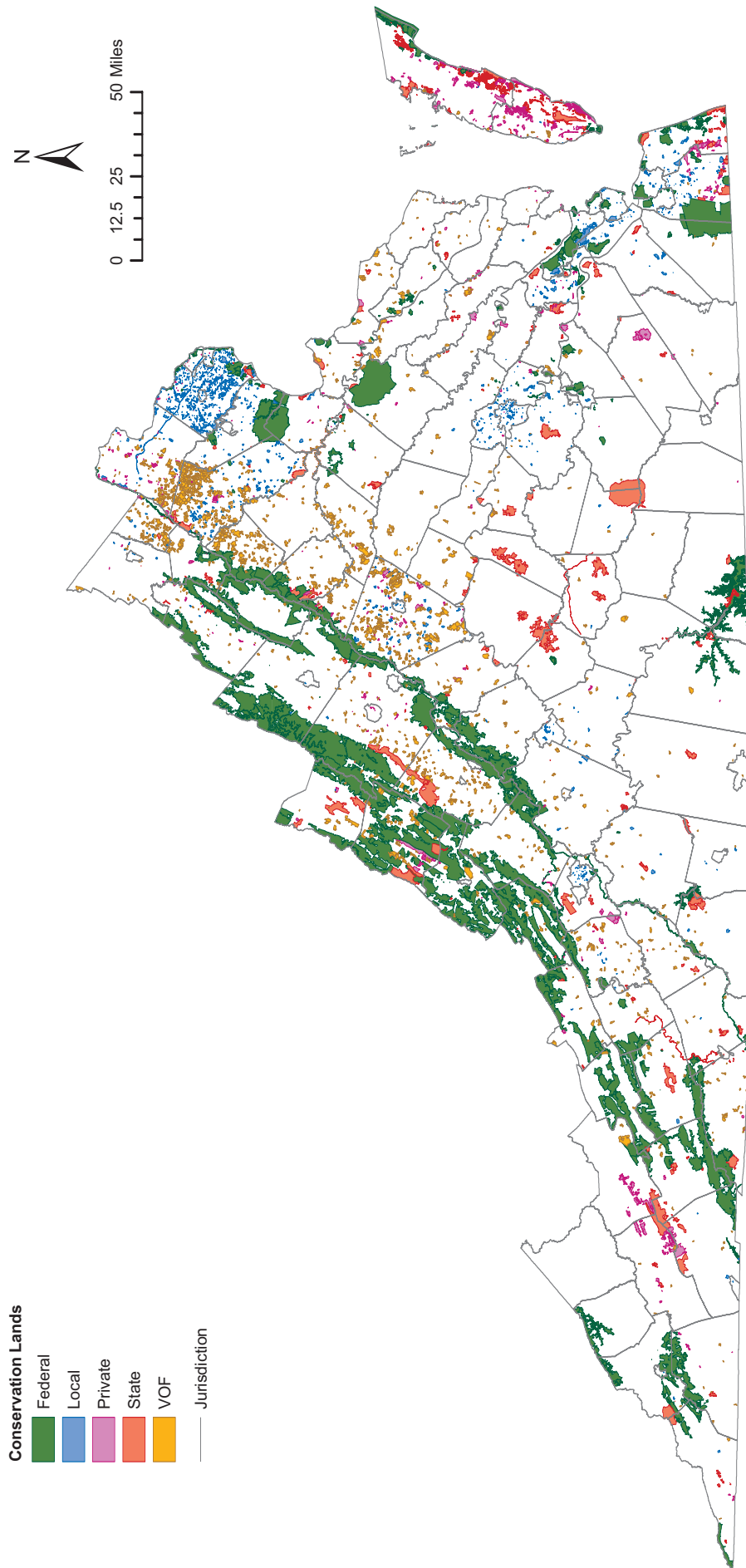
With more than 600 unprotected globally significant conservation sites, DCR has set a goal to add 30 new preserves that protect the highest priority conservation sites in Virginia by 2012, while continuing to expand existing preserves to more fully protect the areas encompassed by their designated conservation sites. This ambitious goal can be achieved through added outreach to inform landowners of current state and federal tax credit programs, full utilization of 2002 Bond funds, federal matching grants and funding through the Virginia Land Conservation Foundation.

Another tool for protecting natural heritage resources will be to incorporate greater protections in newly written conservation easements. Over the past year, DCR has made significant advances with the land trust community, but success in this area will require additional work with agencies and organizations that secure conservation easements.

Karst protection

Important natural heritage resources are supported by surface and subsurface communities in cave and karst habitats west of the Blue Ridge Mountains. Karst landscapes are characterized by sinkholes, sinking streams, springs and caves that have formed in areas where mildly acidic groundwater has dissolved solu-

Map IX-7. Conservation Lands



Data Source: VA-DCR - Virginia Conservation Lands Database

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ble rocks, such as limestone, dolostone, marble or gypsum. Virginia is rich in karst resources and is known to have more than 4,300 caves. More than 150 cave organisms are considered rare, and many of them have distributions restricted to only one or two caves.

Because of the biological diversity importance of cave and karst communities, the unique hazards of development on karst, and ease of movement of contaminants into karst groundwater systems, DCR's Natural Heritage staff developed the Karst Groundwater Protection Program and Karst Education Program in Southwest Virginia. These programs benefit not only the myriad karst organisms, but also the thousands of Virginians who rely on karst aquifers for their drinking water. DCR karst program staff work very closely with the state and national cave conservation and education programs, the Virginia Cave Board, karst landowners and local governments to increase awareness and support for karst conservation. However, as areas west of the Blue Ridge continue to grow, there is an increasing need to expand karst protection efforts to keep pace with development.

Stewardship

Natural area stewardship involves maintaining and enhancing natural heritage resources on natural area preserves managed by DCR. A dedicated natural area is one where future uses have been limited through a legal deed of dedication. Dedicated natural areas become part of Virginia's Natural Area Preserve System, which, as of September 1, 2007, consists of 50 preserves totaling more than 42,296 acres (see Map IX-8). Stewardship staff members also provide expertise and assistance in natural areas management to federal, state and local agencies, as well as to private landowners and land managers. Key components of natural areas stewardship include development of site specific management plans, prescribed burning, invasive species control, habitat restoration,

research and monitoring, public access management and site security. A copy of Virginia's Natural Area Preserve Management Guidelines, can be obtained by contacting the Natural Heritage Program or by visiting the following web address: www.dcr.virginia.gov/natural_heritage/documents/napmgt.pdf.

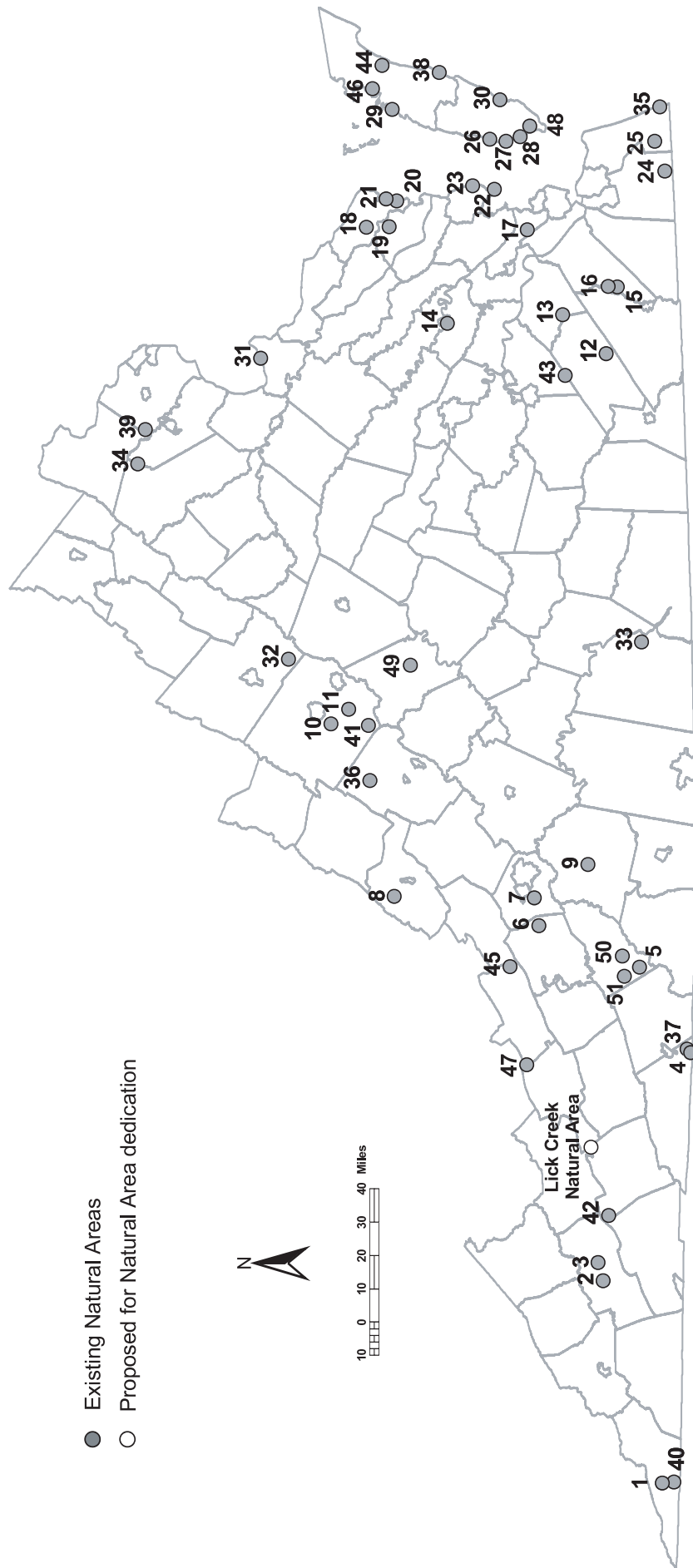
Unfortunately, the growth of DCR's natural area stewardship program has not kept pace with the growth of the Natural Area Preserve system. Currently, only 12 full-time staff manage the state's natural area preserves, as well as provide support to other public and private landowners with natural heritage resources on their lands. In order to meet these responsibilities, DCR needs to increase its stewardship capacity to appropriately manage the state's award winning natural area preserve system.

As the support agency for Virginia's Invasive Species Working Group, DCR plays an important role in helping the Commonwealth manage exotic invasive plant and animal species. More than 300 exotic species have been identified in Virginia, many of which are highly invasive and severely disrupt native plant and animal communities. Invasive species also have a very significant impact on Virginia's economy. Conservative estimates place the cost of invasive alien species to Virginians at \$1.4 billion to \$3 billion annually. DCR and other conservation agencies, local governments, organizations and private citizens need additional resources to meet this growing threat (Pimentel).

References

Cornell University economist/ecologist David Pimentel, derives these figures for Virginia from his widely cited national study: Pimentel, D. et al. 2000. Environmental and Economic Costs Associated with Non-indigenous Species in the United States. *Bioscience* 50(1) 53-65 (15 Dec. 2000).

Map IX-8. State Natural Area Preserve System



- Existing Natural Areas
- Proposed for Natural Area dedication

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| 1. The Cedars | 27. Cape Charles Coastal Habitat | 40. Unthanks Cave |
| 2. Cleveland Barrens | 28. William B. Trower Bayshore | 41. Mount Joy Pond |
| 3. Pinnacle | 29. Parkers Marsh | 42. Red Rock Mountain |
| 4. Big Spring Bog | 30. Wreck Island | 43. Cherry Orchard Bog |
| 5. Buffalo Mountain | 31. Chotank Creek | 44. Mutton Hunk Fen |
| 6. Pedlar Hills | 32. Deep Run Ponds | 45. Clover Hollow |
| 7. Poor Mountain | 33. Difficult Creek | 46. Marks and Jacks Islands |
| 8. Johnsons Creek | 34. Bull Run Mountains | 47. Chestnut Ridge |
| 9. Grassy Hill | 35. False Cape State Park | 48. Magothy Bay |
| 10. Folly Mills Fen | 36. Goshen Pass | 49. Naked Mountain |
| 11. Cowbane Wet Prairie | 37. Grayson Glades | 50. Chestnut Creek Wetland |
| 12. Chub Sandhill | 38. Parramore Island | 51. Camp Branch Wetlands |
| 13. Dendron Swamp | 39. Elklick Woodlands | |
| | | |
| 14. Cumberland Marsh | | |
| 15. Blackwater Ecological Preserve | | |
| 16. Antioch Pines | | |
| 17. Grafton Ponds | | |
| 18. Bush Mill Stream | | |
| 19. Hickory Hollow | | |
| 20. Hughlett Point | | |
| 21. Dameron Marsh | | |
| 22. New Point Comfort | | |
| 23. Bethel Beach | | |
| 24. Northwest River | | |
| 25. North Landing River | | |
| 26. Savage Neck | | |